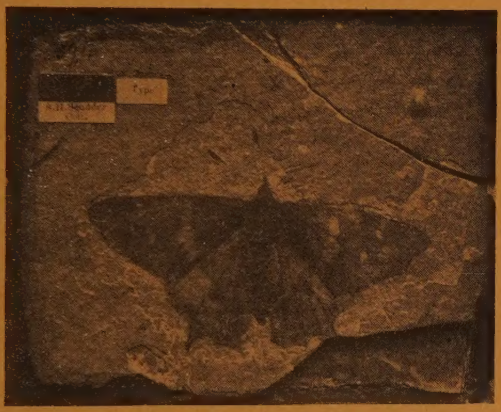
PSYCHE

A JOURNAL OF ENTOMOLOGY

ESTABLISHED IN 1874

VOL. XXIV FEBRUARY, 1917 NUMBER 1



Prodryas persephone Scudder.

CONTENTS.

The Growth of Insect Blood Cells in Vitro. *R. W. Glaser* 1

Notes on Rearing Insects for Experimental Purposes and Life History Work. *A. M. Wilcox* 7

Notes on North American Tingidæ (Hemiptera). *H. M. Parshley* . . 13

The North American Ants Described by Asa Fitch. *W. M. Wheeler* . 26

A New Malayan Ant of the Genus Prodiscothyrea. *W. M. Wheeler* . 29

Anthocyanin in *Pterocomma smithiæ*. *R. W. Glaser* 30

Exchange Column 31

CAMBRIDGE ENTOMOLOGICAL CLUB.

OFFICERS FOR 1917.

President . . . . . F. G. Carnochan.
Vice-president . . . . . S. W. Denton.
Secretary . . . . . H. M. Parshley.
Treasurer . . . . . H. A. Preston.
Executive Committee
A. F. Burgess, F. W. Dodge, R. W. Glaser.

EDITORIAL BOARD OF PSYCHE.

EDITOR-IN-CHIEF.

C. T. Brues, Harvard University.

ASSISTANT EDITOR.

W. M. Mann, Harvard University.

ASSOCIATE EDITORS.

C. W. Johnson, Boston Society of Natural History.
V. L. Kellogg, Stanford University.
A. L. Melander, Washington State College.
A. P. Morse, Wellesley College.
J. H. Emerton, Boston, Mass.
J. G. Needham, Cornell University.
W. M. Wheeler, Harvard University.

Psyche is published bi-monthly, the issues appearing in February, April, June, August, October and December. Subscription price, per year, payable in advance: $1.50 to subscribers in the United States, Canada or Mexico; foreign postage 15 cents extra. Single copies, 35 cents.

Cheques and remittances should be addressed to H. A. Preston, 17 East Highland Ave., Melrose Highlands, Mass.

Orders for back volumes, missing numbers, notices of change of address, etc., should be sent to Dr. W. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

IMPORTANT NOTICE TO CONTRIBUTORS.

Manuscripts intended for publication, books intended for review, and other editorial matter should be addressed to Professor C. T. Brues, Bussey Institution, Forest Hills, Boston, Mass.

Authors contributing articles over 8 printed pages in length will be required to bear a part of the extra expense for additional pages. This expense will be that of typesetting only, which is about one dollar per page. The actual cost of preparing cuts for all illustrations must be borne by contributors; the expense for full page plates from line drawings is approximately $2.40 each, and for full page half-tones $3.60 each, smaller sizes in proportion.

REPRINTS OF ARTICLES CAN BE SUPPLIED AT THE FOLLOWING RATES:

Number of pages	50 copies without covers	100 copies without covers	50 copies with covers	100 copies with covers
1–4	$1.50	$2.50	$3 50	$4.50
5–8	3.50	5.80	5.50	7.80
9–12	4.25	7.05	6.25	9.05
13–16	4.75	7 90	6.75	9.90

No reduction can be made for less than 50 copies.

PSYCHE

VOL. XXIV FEBRUARY, 1917 No. 1

THE GROWTH OF INSECT BLOOD CELLS IN VITRO.[1]

By R. W. Glaser.

In order to obtain an insight into various pathological changes taking place in diseased insect tissue, I undertook a series of experiments dealing with the cultivation of such tissue in vitro. The degenerative changes occurring in normal and in pathological blood cells were especially studied for the reason that the blood is frequently used in diagnosing the health of a particular insect. In the polyhedral diseases of insects a general picture of the progress during the later stages of the disease can be obtained by examination of the blood. This type of disease is recognized by the fact that nucleoprotein reaction bodies, termed polyhedra, are formed within the nuclei of the blood and certain other tissue cells. It was also of considerable interest to ascertain whether slides with growing insect tissue could be infected with the polyhedral disease virus and whether polyhedra would form within the nuclei of cells thus infected. By way of comparison, it was also of interest to see through what changes normal cells pass when permitted to degenerate naturally.

Incidentally, a number of observations were made in regard to the morphology and behavior of growing insect blood cells and I will present the observations in the hope of stimulating work along these lines. Although the cultivation of insect tissue is not new, this method of studying various embryological, morphological, and physiological questions pertaining to entomology has been almost entirely neglected and I am convinced that the cultivation of tissues will greatly simplify the solution to many difficult problems.

Goldschmidt in 1915, by means of the tissue culture method,

[1] Contribution from the Entomological Laboratory of the Bussey Institution in coöperation with the U. S. Bureau of Entomology. (Bussey Institution No. 125.)

studied the spermatogenesis of *Samia cecropia* L. Spermatogonia or young spermatocytes were kept alive for about three weeks, and the follicle membrane for some weeks more. This piece of work and that of Lewis and Robertson, 1916, on the male germ cells of *Chorthippus curtipennis* Scudd (*Stenobothrus curtipennis* Harris) seem to be the only examples of insect tissue cultivation found in the literature.

For the experiments here described the larvæ of *Malacosoma americanum*, *Cirphis unipuncta*, *Laphygma frugiperda* and *Porthetria dispar* were used. My method did not differ materially from those of Harrison, Carrel, Goldschmidt, etc. However, since most of my experiments dealt with the cultivation of insect blood I will briefly outline the method of procedure. The larvæ to be operated upon are held upside down in one hand and the anterior and posterior halves bent back. A proleg is then thoroughly washed with 80 to 95 per cent. alcohol after which it is clipped with very fine aseptic scissors. The drop of blood which oozes out is caught on a sterile cover slip which is then placed on a sterile depression slide and the edges sealed up with sterile vaseline. A great many slides were prepared in this manner, *i.e.*, the blood corpuscles were simply mounted in their own plasma. In other cases Locke's solution,[1] or a mixture of Locke's solution and plasma was found satisfactory. In general Locke's solution is isotonic with insect tissue and can be very freely used for cultivation and for the washing out of old cultures in order to free them of harmful by-products. Locke's solution has no particular advantage over the plasma, except that the preparations are a bit more transparent, owing to the fact that large amounts of fibrin have been eliminated.

Blood was obtained from healthy *Malacosoma americanum* larvæ and six slides prepared. In a few days some of the blood cells disintegrated, but the majority lived and multiplied. In ten days beautiful syncytia had formed (Pl. I, fig. 1). At the end of this time three of the slides were inoculated with some polyhedral material which had been passed through Berkefeld Grade "N" candles. The other three slides were kept as checks. All slides were observed for forty days. After this the cells in both experiments and checks ceased growing and disintegrated normally.

[1] Locke's solution consists of NaCl 0.9 per cent., $CaCl_2$ 0.025 per cent., KCl 0.042 per cent., $NaHCO_3$ 0.02 per cent., Dextrose 0.25 per cent., Peptone 0.2 per cent.

The inoculated slides showed no indications of the formation of polyhedral bodies within the nuclei of the blood cells. This experiment was repeated twice more and with the same result; no difference between the experiments and checks was observed.

Twelve healthy *M. americanum* larvæ were fed with polyhedral virus passed through Berkefeld Grade "N" filters. As checks the same number of larvæ were infected with the virus sterilized by autoclaving. At the end of ten days tissue culture preparations were made with blood taken from the experimental animals and from the checks. The slides were studied at once and it was found that two thirds of them, representing blood taken from animals fed with the unsterilized virus, showed infection. The early stages of polyhedra were discernible within the nuclei of many of the blood cells. Other cells still seemed to be in a normal condition. The slides representing blood taken from the checks appeared perfectly normal. The next day all of the slides were again examined, but no change was noticed with the exception that some of the cells had divided. In one day more nearly all of the experimental blood cell nuclei were beset with large and small polyhedra. In six to seven days the blood cells from the experimental animals began to disintegrate with the liberation of small and large, well formed, typical polyhedra. The cells on the check slides disintegrated normally five days later.

A large number of the blood cells of *M. americanum* are of the mulberry corpuscle type (Pl. I, fig. 2). These are not so well adapted to cultivation as the ordinary blood cells (Pl. I, figs. 3 and 4). For this reason the experiments were repeated with the blood of *Porthetria dispar* in which the mulberry cells are in the minority. In these experiments it was likewise impossible to infect growing blood cells with the polyhedral virus, but if animals were first infected the formation of the polyhedra could be traced very nicely by taking the blood from the infected animals in about ten or twelve days and studying by means of the tissue culture method.

What do these experiments signify? Several possibilities at once suggest themselves, but I will merely outline the two most probable. First of all let us suppose that I have actually cultivated the polyhedral virus on the tissue culture slides. Then why is it impossible to infect such tissue directly with the virus? Why is it necessary to give the virus "a start" within the insect itself? Per-

haps the early stages of the virus require some particular organ or tissue or some particular condition. The insect itself fulfills the required condition, but the blood cells growing in vitro do not. The later stages of the virus, however, find the conditions suitable on the tissue culture slides.

Then again I may not have cultivated the virus at all. The caterpillars were infected with the polyhedral virus which may have a strong affinity for some particular tissue other than the blood. Toxins may be elaborated and getting into the blood may start the degenerative changes which culminate in the formation of polyhedral bodies. These degenerative changes, after beginning within the animal, may later proceed outside of it on the tissue culture slides in the absence of the virus. I think that a series of passage infections would clear up the whole matter. This I have not yet attempted. A series of animals should be infected with fresh virus. In ten or twelve days tissue culture slides should be prepared from the blood. When polyhedral bodies begin to form, another series of animals should be infected from the slides. In ten or twelve days the blood should be taken from these animals and kept on slides and if polyhedra form, a fresh series of animals should be again infected and so on. Such a series must, of course, be accompanied by suitable checks. If the animals in the later experimental series die typically and if there is no increase in the period from infection to death (about twenty days) it would be fairly certain that the virus has been cultivated and that one is not dealing with a partial recovery of the amount of the virus originally used.

In cultivating insect tissue it is always well to prepare a great many slides. A few become contaminated with bacteria, but many disintegrate normally without showing the least inclination towards growth. The ability of the tissue to grow well also seems to a slight degree to vary according to the species of insect. The tent-caterpillar blood, for instance, does not grow as readily as the blood taken from the true army or fall-army worm. The blood from these two species does not grow nearly so well as the blood of the gipsy-moth caterpillar. One should never discard slides for at least a week or more. Very frequently nearly all of the cells will disintegrate during the first five or six days. A few, however, live and these later increase and multiply forming beautiful

syncytia. I have frequently given up slides as hopeless on account of what seemed to me to be complete disintegration, yet on reëxamination in about two weeks, I was astonished to find clusters of healthy looking, growing cells.

I have kept true army and fall-army worm blood preparations alive for one month without washing out the cultures or transferring them to a fresh medium. Gipsy-moth blood cultures have been kept alive for as long as seventeen weeks without washing or transferring. It is true, the cells were no longer vigorous and showed signs of beginning degeneracy, but they were alive. After washing out these old cultures with sterile Locke's solution and filter paper, as is usually done, and transferring to a fresh medium like Locke's solution the cells grew and multiplied as before.

In so far as the morphological elements contained in insect blood are concerned, the ordinary amœbocytes (Pl. I, figs. 3 and 4) are the only ones which multiply in tissue cultures. The minute amœbocytes (Pl. I, fig. 5), the mulberry corpuscles (Pl. I, fig. 2), and the cytoplasmic free cells (Pl. I, fig. 6) described by me in 1915[1] always disintegrate. A difference of opinion seems to exist in the literature as to the origin of the blood corpuscles of larval and adult insects. From my studies it appears that the blood cells, after their differentiation from the mesoderm during embryological development, simply maintain their numerical equilibrium in larvæ and adults by dividing mitotically at certain intervals. I cannot find any so-called blood corpuscle forming tissue at least in sections of caterpillars.

Some of the visible changes observed on the culture slides in normal degenerating blood cells have proved instructive and have further helped to strengthen my views (published elsewhere) in regard to the nature of the polyhedral bodies found in the nuclei of certain pathological cells. Normal disintegration of insect blood cells is always accompanied by the formation of protein crystals within their cytoplasm. Crystalline disintegration accompanied by granular disintegration seems to be the rule in normal disintegrating insect tissue. Granular disintegration alone seems to be exceptional in blood cells at least. In the polyhedral diseases of insects protein crystals are likewise formed within the

[1] Wilt of gipsy-moth caterpillars. Journal of Agricultural Research. Vol. IV, No. 2, May, 1915, p. 113.

degenerating cells, but here the crystals are formed within the nuclei instead of within the cytoplasm.

Normal blood cells in the early stages of disintegration show distinct granulations and also small highly refractive greenish crystals within the cytoplasm (Pl. I, fig. 7). The nucleus does not show any changes till rather late. In a few days the cytoplasmic crystals become more and more numerous and likewise grow in size (Pl. I, fig. 8). Still later they reach the size of 5 and 6μ and assume a shape very closely simulating polyhedra. In a few days more the cells disintegrate, completely liberating granules and crystals (Pl. I, fig. 9). Some of these liberated crystals measure 15μ or more in diameter (Pl. I, fig. 10). Millon's reagent demonstrates their protein nature and I believe that they are similar in many ways to the polyhedra. Of course, the composition of the polyhedra is different, since they are formed within the nuclei under pathological conditions, but what I wish to emphasize is that insect tissue has a normal tendency towards crystalline disintegration. Is it, therefore, so surprising to find crystals (polyhedra) within the degenerating nuclei in a series of insect diseases?

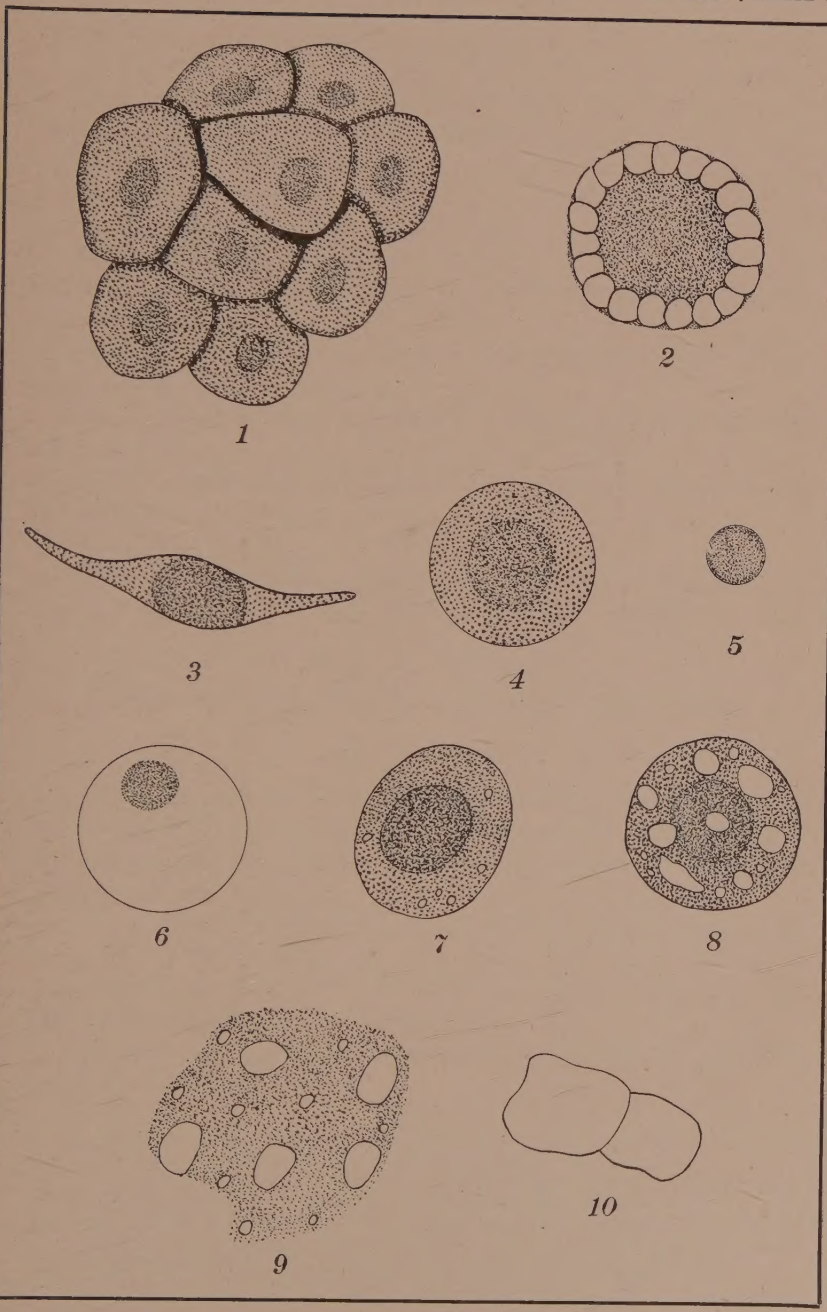
Literature List.

Goldschmidt, R. '15. Some Experiments on Spermatogenesis in Vitro. Proc. Nat. Acad. Sci., Vol. I, p. 220.

Glaser, R. W. '15. Wilt of Gipsy-Moth Caterpillars. Journ. Agric. Research, Vol. IV, No. 2, pp. 101–128, 4 plates, 17 figs.

Glaser, R. W. and Chapman, J. W. '16. The Nature of the Polyhedral Bodies Found in Insects. Biol. Bull., Vol. XXX, No. 5, pp. 367–384, 3 plates, 6 figs.

Lewis, M. R. and Robertson, Wm. R. B. '16. The Mitochondria and Other Structures Observed by the Tissue Culture Method in the Male Germ Cells of *Chorthippus curtipennis* Scudd. Biol. Bull., Vol. XXX, No. 2, pp. 99–114, 5 plates, 51 figs.



GLASER—*Growth of Insect Blood Cells in Vitro.*

Explanation of Plate.

Fig. 1. Syncytium of growing amœbocytes.
Fig. 2. A type of mulberry corpuscle.
Fig. 3. Amœboid amœbocyte.
Fig. 4. Round amœbocyte.
Fig. 5. Minute amœbocyte.
Fig. 6. Cytoplasmic free cell.
Fig. 7. Degenerating amœbocyte with a few small, refractive crystals in cytoplasm.
Fig. 8. Degenerating amœboycte with numerous large, refractive crystals in cytoplasm.
Fig. 9. Disintegrated amœbocyte showing liberated granules and crystals.
Fig. 10. Double crystal formed by a normally disintegrating amœbocyte.

NOTES ON REARING INSECTS FOR EXPERIMENTAL PURPOSES AND LIFE-HISTORY WORK.[1]

By A. M. Wilcox,[2]
Gipsy Moth Assistant, U. S. Bureau of Entomology.

Introduction.

During the past two years I have been rearing insects for experimental and life-history studies. While engaged in this work it became necessary to develop new rearing methods and to modify some of the old ones.

The rearing of insects from egg to adult is not always an easy task. Unforeseen difficulties arise anew with every species, in consequence of which I am offering these notes with the hope that entomologists will find them serviceable.

During the life history of insects reared artificially, the following must be observed:

---

[1] Contribution from the entomological laboratory of the Bussey Institution in coöperation with the U. S. Bureau of Entomology. (Bussey Institution, No. 121.)

[2] The writer desires to express his thanks to those who rendered valuable assistance in the preparation of this paper: Prof. William M. Wheeler, Dean of the Bussey Institution, Harvard University, and Mr. A. F. Burgess, in charge of gipsy-moth work, for their helpful criticisms; Dr. R. W. Glaser and Dr. J. W. Chapman of the Bureau of Entomology, for their suggestions; and Mr. Harold A. Preston of the same Bureau for the preparation of the illustrations.

1. Provision for an abundance of normal food.
2. Provision for a suitable larval environment.
3. Provision for a suitable pupal environment.
4. Provision for a suitable adult and egg laying environment.
5. Regulation of temperature and humidity.
6. Prevention of disease.
7. Prevention of parasitism by other insects.

The Use of Fruit Jars with Tin Covers.

The general use of shallow fruit jars (Pl. II, fig. 1) has been found extremely successful for many species of insects. By altering conditions slightly for each stage (egg, larval, pupal and adult), these jars can be used throughout the life of many forms. The jars are four inches deep and four inches in diameter. The tin tops can be screwed on tightly without the use of rubber bands. Insects confined in these jars cannot escape, nor can parasites enter.

It is easy to duplicate conditions required by insects fond of a moist environment or which pupate in the soil. If at any time an excess of moisture forms, it may be diminished by loosening the screw tops or by adding a small quantity of dry sand.

The following constitutes the method used successfully for rearing lepidopterous larvæ:

Care of the Eggs.

The eggs are placed in a jar containing a piece of filter or blotting paper to absorb the excess moisture. The cover is screwed on tightly to prevent any larvæ from escaping when they hatch. Once in every three or four days, the cover is removed for a moment to permit the circulation of air.

Care of the Larvæ.

As soon as hatching commences, a small amount of food is placed in the jars. Several hundred caterpillars may be placed in one jar, but as they increase in size the number per jar should be decreased in order to prevent overcrowding. After the larvæ have molted once or twice, the filter paper may be removed, and a fourth of an inch of dry sand substituted. The sand is changed every three or four days before it becomes foul or mold develops. The jars should be kept shaded to ensure a nearly even temperature.

Care of the Pupæ.

As soon as the larvæ have pupated, the jars are cleaned and moist sand is put in. When moistening the sand, just enough water is added to darken it. The covers are screwed down tightly, but are removed every few days to allow a circulation of fresh air. If the sand becomes too moist, the covers are loosened; if too dry, a few drops of water may be added.

Care of the Adults.

Before emergence, some bits of coarse hay, dry moss or pieces of paper are inserted into the jars to provide a resting place for the adults as soon as they appear. If perfect specimens of large species are desired the lidless jars are placed in a large wooden or pasteboard box. A stiff piece of paper or cardboard is inserted into each jar so the adults may easily crawl out. This arrangement will provide sufficient room for them to expand their wings and dry perfectly.

Mating the Adults.

Some species of insects mate in almost any situation, but the majority prefer a simulation of their natural environment. These conditions may be provided in a number of ways. One of the most satisfactory methods is to grow the food plant of the species of insect concerned in a box of soil. When matings are desired, a small cylindrical wire screen or lamp chimney is placed over some of the food and the males and females placed thereon. When it is necessary for the adults to feed before mating, sugar-water may be provided. The mating cages should be shaded and left undisturbed until after the deposition of the eggs.

Hibernating Pupæ.

The fruit jars have been used with great success in caring for hibernating pupæ. Species that normally hibernate in the soil are placed in jars filled nearly half full of moist sand. This moisture will ensure sufficient humidity for several weeks. The jars should be opened every week or two to allow a circulation of fresh air. This also assists in the prevention of mold development. Jars with hibernating pupæ have been kept in a greenhouse where the temperature ranged from 60° to 80° F. during the day and from 45° to 55° F. at night with success. The jars should be shaded.

Fruit Jars for Rearing Borers.

The jars may be used successfully for rearing borers from twigs, rotten wood, bark and fungi. Moist sand should not be added in this case, otherwise mold will develop.

Fruit Jars with Cheese-cloth Tops.

The jars may be used with cheese-cloth covers especially during damp or rainy weather. Such covers have disadvantages compared with the tin tops. Much time is consumed in tying on the cheese-cloth, or if rubber bands are used, they are apt to break and allow the insects to escape. In dry weather the food does not remain fresh by the use of the cheese-cloth tops.

Other Methods.

Caterpillars Reared in Bulk.

If several hundred larvæ of a species, that normally pupate in the soil, are to be reared together, the following method has proven successful:

A pen or corral was made of sheet tin or zinc. This was placed in the soil to a depth of two inches, while the upper edges were tanglefooted or the top covered with cheese-cloth. The tanglefoot prevents the larvæ from crawling out, but cheese-cloth is at times preferable if parasites are abundant.

The mortality from wilt and other diseases is generally quite high in this type of rearing cage because the crowding aids the spread of infection.

Tin Boxes.

Isolated material is often desired, especially in experimental studies. For this work, I make use of small tin boxes with tightly fitting covers, one inch deep and two and a half inches in diameter. These boxes take up very little space, are easily cleaned by boiling in water or by sterilizing, and can be used repeatedly. They prevent parasites from entering and the larvæ seem not to suffer in the least from the confinement. If the boxes are shaded the food keeps fresh for several days or until eaten.

When the larvæ are nearly ready to pupate, a little sand is placed in the boxes. Moisture emitted by the food and larvæ is generally sufficient, but a few drops of water may be added to the sand when needed.

Battery Jars.

Battery jars (Pl. III, fig. 1) with pieces of glass for covers have been quite useful for rearing some insects. The glass covers ensure a high humidity and this naturally keeps the food fresh. Such jars were found to be very satisfactory for rearing silkworms, many hundred having been reared during the summers of 1915 and 1916.

Sand was placed in the bottom of the jars. During damp weather, or when there was an excess of water of condensation, the covers were removed to facilitate evaporation. Silkworms, as is known, do not ordinarily leave their food, so the covers could be removed with impunity.

For rearing wood-boring insects, the battery jars have also been found very useful.

Trays.

Several types of trays, designed at the Gipsy Moth Laboratory at Melrose Highlands, Mass., have been used quite extensively in rearing gipsy moths during the past few years. I have used trays of various sizes and shapes. The trays (Pl. III, fig. 2) were usually made entirely of cardboard or wood with cheese-cloth or paraffin paper bottoms. To prevent larvæ from escaping, the edges of the trays were smeared with tangle-foot. These trays are used extensively, but when a large number of larvæ are reared in a single tray, some difficulty is experienced, for the larvæ often get caught in the tangle-foot and eventually form a bridge over which others escape. The tangle-foot must be repeatedly combed or stirred with a stiff brush. This cleans the tangle-foot and also forms ridges over which it is difficult for the larvæ to escape.

Diseases frequently develop and the mortality is generally high in such trays.

Riley Cages.

I have used a modified type of the Riley cage built for the Gipsy Moth Laboratory, with considerable success. The frames are built of wood, covered with a fine wire mesh. They are provided with removable wooden bottoms and have a door on one side. The cages are sixteen inches square and twenty-four inches in height.

Considerable material, especially Cerambycids and their para-

sites, have been reared in these cages, from dead wood, etc. The cages were kept in a green-house, in a shaded position, and the wood containing the insects was moistened about once a week.

The cages have also been utilized to some extent for rearing army-worms out of doors. In this case the bottoms were removed and the cages set in soil in a shaded place. If only a small number of larvæ are to be reared, the cages may be placed over the insects' natural food plant, but if one is dealing with great numbers, the food must be renewed daily. The cages are also useful in making matings. Some trouble was experienced by the swelling or shrinking of the cage doors, depending on weather conditions.

Test Tubes.

For rearing fruit-flies of the genus Drosophila, test tubes (Pl. II, fig. 2) have proven very successful. An artificial food, banana agar, was used. This was made by crushing four ripe bananas and allowing them to infuse in 500 cc. of distilled water. The liquid was strained and $7\frac{1}{2}$ grams of powdered agar added. The whole was then cooked until the agar was dissolved. The mixture was poured into test tubes, after which the tubes were sterilized and permitted to cool in a slanting position. Non-absorbent cotton plugs were used. The flies will readily oviposit on this medium and many generations a year may be reared. A piece of filter paper was placed in the tubes for the maggots to pupate upon. Fresh tubes are used for each generation. When newly hatched flies are to be transferred, they are first stupefied with ether.

The banana agar is nearly transparent which enables one to note the feeding habits, etc., of the larvæ.

Explanation of Plates II and III.

Plate II, Fig. 1. Fruit jars used for rearing various insects.

Plate II, Fig. 2. Test tubes used for rearing flies of the genus Drosophila.

Plate III, Fig. 1. Battery jars used for rearing various insects.

Plate III, Fig. 2. Tray with paraffin paper bottom, for rearing insects.

Fig. 1

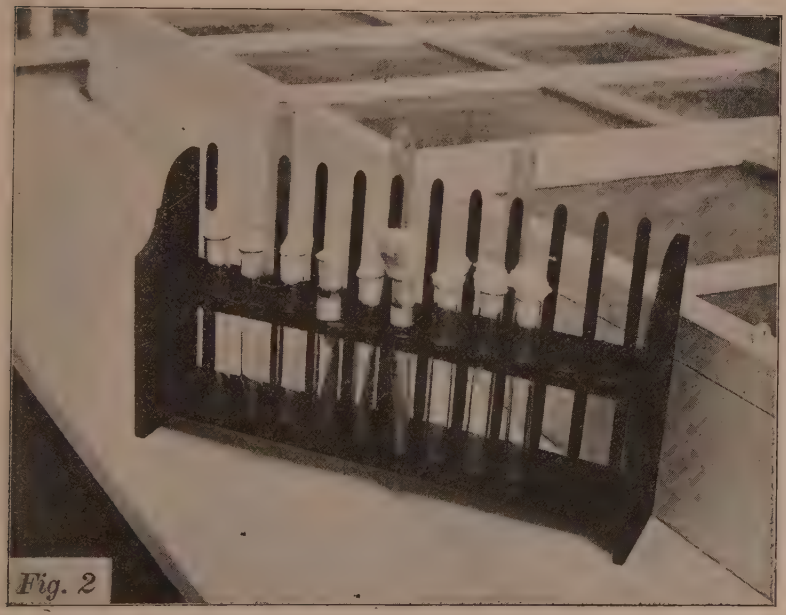


Fig. 2

WILCOX—*Methods of Rearing Insects.*

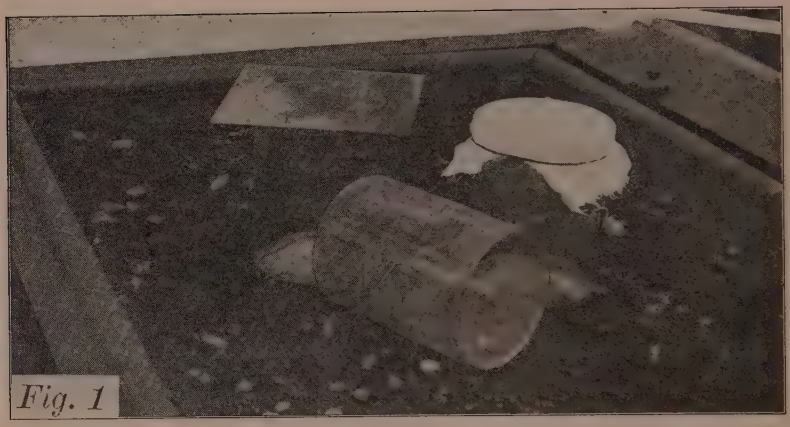


Fig. 1

Fig. 2

WILCOX—*Methods of Rearing Insects.*

NOTES ON NORTH AMERICAN TINGIDÆ (HEMIPTERA).[1]

By H. M. Parshley.

A number of highly interesting forms of the Hemipterous family Tingidæ have recently been submitted to me for study by Mr. Nathan Banks of the Museum of Comparative Zoölogy and others mentioned below. In treating this material it has been necessary to take into account the recent publications of Osborn and Drake,[2] in which there is much requiring comment, as hereafter noted in part. Most of the conclusions were reached by a study of the papers cited in the light of Tingid material in my hands, and they have been verified by an examination of the type specimens concerned, through the courtesy of Professor Osborn.

The eminent European Hemipterist Bergroth has recently remarked on several occasions that the modern system of specific type fixation is likely to promote inadequate describing, and although many will not be able to approve his resultant refusal to designate definite type specimens, the force of his remarks must yet be strongly felt when it becomes necessary to deal with descriptions which are not only inadequate but even seem, in some particulars at least, to have been based upon a study of highly inaccurate figures rather than specimens—work which without some revision puts serious obstacles in the way of later investigators. Of course the designation of type specimens is not entirely to blame for this, but the feeling that species, however inadequately characterized, and genera, even without any description, are firmly established if only types are designated, tends to belittle the importance of the written record. After all, the printed word, capable of indefinite reduplication, accessible to everyone, and permanent, is of prime importance; while type specimens, limited in number, generally inaccessible, and perishable in nature, should be treated as of merely supplementary value. For this reason I am in accord with Van Duzee and others who

---

[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 127.

[2] The Tingitoidea of Ohio, Ohio Biol. Surv., Vol. 2, Bull. 8, 1916, pp. 217–251.
Some New Species of Nearctic Tingidæ, Ohio Jour. Sci., Vol. 17, 1916, pp. 9–15.

maintain that where description and type disagree in important particulars, the former should take precedence.

Acalypta lillanis Bueno.

In their first paper Osborn and Drake properly treat the long- and short-winged forms as conspecific, but the drawing on page 221 is very inaccurate as regards the structure of the head, which, of course, is precisely similar in the two forms of the species. The differences in head and antennal structure to be noted in comparing this figure with that on the next page do not exist in nature. This is no doubt due in part to the fact that the artist, being unfamiliar with the subject, drew the two specimens from somewhat different points of view. The authors are then entirely unjustified in announcing, on page 9 of their second paper, that de la Torre Bueno's species is composite, the more so as they have not studied his extensive type series which I can state, after careful examination, to be perfectly homogeneous, as is a good series of the species in Mr. H. G. Barber's collection. Moreover, there is nothing in the original description[1] on which the assumption can be based, and it thus appears that as in some other cases undue attention has been given drawings of doubtful accuracy. Whether or not the type specimen of *A. ovata* O. & D. represents a species distinct from *lillianis* is another question. It is a little broader posteriorly than is usual in the short-winged form of the latter species and the first antennal segment is slightly different in form, but it agrees with the figure little better and presents no characters that I would consider of specific importance.

Fenestrella O. & D.

In their description of this extraordinary genus the founders omit to mention the following important characters: the bucculæ are contiguous anteriorly, much as in *Melanorhopala*, for instance; the metasternal orifices are obsolete; the surface of the hemielytra is deeply channelled, the main veins being raised on very prominent roof-like elevations, a condition which would be somewhat modified in the as yet unknown long-winged form. The drawing of the type species on page 223 of the first paper is inaccurate in numerous particulars: the general form is in reality much less elongate, the

[1] Bull. Brooklyn Ent. Soc., Vol. 11, 1916, p. 39.

costal margin being more abruptly curved posteriorly than the figure would indicate; the base of the third antennal segment is slightly capitate; the eyes project laterally less than one third their width beyond the antenniferous tubercles, etc. *Fenestrella* is extremely isolated, having no close relationship with any Palæarctic or American genus known to me. It differs from *Acalypta* in some of the most important characters, and yet it cannot be placed elsewhere with much greater propriety. Further material in the genus will be awaited with great interest.

Corythucha Stal.

As I am hoping to treat the North American forms of this genus in a later paper, I shall make no other comment here than to point out that while most of the new species recently described by Osborn and Drake are very distinct and well known forms, there are some which cannot be located without reference to the types, because it is impossible to deduce from the descriptions an adequate notion of the important characters derived from exact relative width and height of the hood and from the altitude of the median carina with reference to that of the hood.

Galeatus peckhami Ashm.

Of the two examples of this species known to me to have been taken in New England, one was found at Princeton, Me., and the other near the Glen House, Mt. Washington, N. H., both collected by Mr. C. W. Johnson. I have already published the latter record,[1] which may be what Osborn and Drake erroneously refer to on page 237 of their first paper. Uhler in his paper[2] on the Hemiptera of Las Vegas Hot Springs, N. M., makes reference indefinitely to Massachusetts in discussing the distribution of this species, but as is the case with so many of the faunistic generalizations of this author, confirmatory records of actual capture are desirable if one is seeking exact knowledge.

Leptobyrsa rhododendri Horv.

Champion has recently shown[3] that *L. explanata* Heid. is synon-

[1] Ent. News, Vol. 27, 1916, p. 105. The Connecticut record for *Zelus socius* Uhl. given in this paper pertains to *Z. audax* Banks.

[2] Proc. U. S. N. Mus., Vol. 27, 1904, p. 362.

[3] Ent. Mo. Mag., Vol. 52, 1916, p. 207–208.

ymous with Horváth's previously published name. The species was first described from Holland where it was found infesting rhododendrons, probably as a visitor from the United States, and recently it has similarly occurred in England. As noted by Champion, Heidemann's generic reference is correct, as the lateral pronotal carinae are percurrent in this species and not abbreviated as in *Stephanitis* Stal.

Leptoypha Stal.

The rather common misspelling, *Leptophya*, is perpetuated by Osborn and Drake on page 241 of their first paper. In their generic diagnosis it is the posterior "tip" of the rostral sulcus which is described as open, though in reality it is nearly or quite closed by the convergent ends of the metasternal ridges. In *L. mutica* Say the head is provided with five spines as in related forms.

The chief characters separating *Leptoypha* from closely allied genera may be stated as follows: Entire surface very finely and evenly reticulate; antennæ short, cylindrical, the third segment not greatly longer than the others together; hood absent; lateral carinæ absent or vestigial; paranota linear, cariniform; costal area linear or narrow and uniseriate; subcostal area with 4–6 rows of areoles.

Leptoypha costata sp. nov.

Long-winged form.—Brown, shining, evenly and finely reticulate; more or less variegated with vague darker markings; pronotum with a black transverse suture interrupted at middle; body beneath chestnut brown, sternal region infuscated.

Head broad; vertex punctate at middle; basal spines short, reaching base of anterior spines, which are short and curved with apices meeting that of median spine; antenniferous tubercles moderate in size, oblique, rounded exteriorly; antennæ short, cylindrical, minutely pubescent, first and second segments nearly equal, slightly longer than broad, thickest, third slightly more slender, cylindrical, a little less than twice as long as the first two together, fourth somewhat longer than the first, fusiform. Pronotum convex at middle, narrowed anteriorly, depressed behind the narrow raised apical collar; median carina slightly raised but appreciably percurrent; lateral carinæ parallel, exceedingly faint, beginning just anterior to summit of pronotal convexity and extending to margins of angu-

late process. Paranota[1] linear, cariniform, exterior margin straight, somewhat broader anteriorly. Hemielytra at middle distinctly broader than pronotum, extending a little beyond apex of abdomen; costal area narrow, distinctly uniseriate, biseriate anteriorly; subcostal area with 5 or 6 rows of areoles at most, obtusely angulate at apex of discoidal, which extends beyond middle of hemielytra; sutural with slightly larger areoles apically. Legs rather robust. Rostrum scarcely reaching middle coxæ. Orifices but slightly elevated, narrow, transverse. Pleuræ largely reticulate. Abdomen shining, the segments roughened posteriorly. Hind wings almost as long as hemielytra. Form obovate, broadest behind middle, costal margin nearly straight in apical half. Length ♀, 2.8 mm.; width 1.3 mm.

Holotype and paratype, two ♀ ♀, Marshall Hall, Md., 1 August, 1891 (N. Banks), in M. C. Z. Collection.

This species is easily distinguished from *mutica* by its shorter and broader form, slightly shorter antennæ with more slender third segment and distinctly shorter fourth, somewhat more prominent paranota, and especially by its distinct and completely reticulated costal area which in Say's species is cariniform and perceptibly reticulate only toward apex. The lateral pronotal carinæ are very inconspicuous in *costata* and obsolete or nearly so in *mutica*.

Physatocheila Fieb.

In connection with my treatment of the North American species in a recent paper,[2] it should be made clear that the arrangement of areoles in the costal area is somewhat variable and not always symmetrical, although a majority of specimens exhibit the conditions described. In cases of doubt the other characters mentioned are amply sufficient to insure recognition of the forms.

Melanorhopala Stal.

Our conception of this genus must be slightly modified to accommodate *M. duryi* O. & D. and the new form described below, which, though in my opinion congeneric with *clavata*, exhibits certain marked differences. According to this view the chief characters

---

[1] See Jour. New York Ent. Soc., Vol. 24, 1916, p. 8. Crampton in a morphological paper has proposed this convenient name for the lateral expansions of the pronotum.

[2] Psyche, Vol. 23, 1916, pp. 163–168. The holotype of *D. tricornis americana* is in the collection of the Boston Society National History, not in mine, as erroneously stated on p. 164.

of *Melanorhopala* may be stated as follows: Form elongate, depressed, the hemielytra flat or showing only the slightest convexity. Antennæ usually rather long and slender, the third segment cylindrical, usually somewhat curved and enlarged toward the apex in varying degrees. Pronotum tricarinate; hood small and not produced anteriorly; paranota narrow, uniseriate, reflexed vertically or against the pronotal surface. Hemielytra in the long-winged form widely overlapping and broadly rounded at apex, in the short-winged form very slightly overlapping, acute and distinctly divaricate at apex; main veins distinctly costate; costal area usually uniseriate, sometimes irregularly biseriate; subcostal area biseriate.

The following table will assist in separating the species:

1. Third antennal segment slender, not thicker than the fourth except sometimes at extreme apex; size larger.....2
   Third antennal segment rather thick, cylindrical, slightly clavate toward apex which is one third thicker than the fourth segment; form very broad; length, 3.5 mm. *duryi* O. & D.
2. Costal area (costal membrane of Stal) uniseriate, evenly reticulated; color pale and uniform in general.....3
   Costal area bi- or triseriate in part, irregularly reticulated; color variegated.....*infuscata* sp. nov.
3. Third antennal segment very slender, much thinner than the fourth, abruptly and strongly clavate at apex; fourth segment conical.....*clavata* Stal.
   Third antennal segment less slender, but little thinner than the fourth, less enlarged at apex; fourth fusiform.....4
4. Length less than 5 mm.; form narrow; paranota vertically reflexed; antennæ distinctly though not strongly clavate *obscura* Parsh.
   Length more than 5 mm.; paranota reflexed almost or quite against pronotal surface; antennæ scarcely clavate.....5
5. Antennæ very long, extending beyond apex of abdomen; second segment distinctly narrowed at base; form narrow *lurida* Stal.
   Antennæ much shorter; second segment less narrowed at base; form broad.....*uniformis* Stal.

M. duryi O. & D.

The shape of the antennæ in this species is not correctly represented in the figure given by the authors on page 15 of their second paper. In the type specimen the first and second segments are nearly equal in size, the third almost perfectly cylindrical with some slight enlargement toward the apex, decidedly longer in proportion to its thickness than indicated, and slightly curved as in all the other species of the genus except *infuscata*, and the fourth is thinner than the figure shows and fusiform, not conical. The anterior spines of the head are short and decidedly curved, the main veins of the hemielytra though strongly costate are unusually irregular, tending to follow the outlines of the areoles, and the general form is very broad, even for a short-winged form.

M. lurida Stal and **M. uniformis** Stal.

I believe that these species have been correctly located by Osborn and Drake, as from Stal's descriptions it is impossible to suppose that these species differ from *clavata* in any characters of importance beyond those drawn from the form of the antennæ. I have seen *infuscata* sp. nov. in several collections determined as *uniformis*, but the former differs so strikingly from *clavata*, to which the latter is compared by Stal, that such a view cannot be entertained unless examination of Stal's type should unexpectedly demonstrate its truth.

Melanorhopala infuscata sp. nov.

Long-winged form.—Dark yellowish brown with conspicuous darker markings. Head uniform brown, the spines paler; antennæ dark brown, the fourth segment and apex of third slightly darker. Pronotum broadly and variably infuscated, lateral margins and hood excepted; apex of angulate process yellowish white. Hemielytra variegated with very irregular and variable infuscation of veinlets here and there in all the areas, the infuscation sometimes extending to large portions of the surface; sutural area with a large paler region at apex. Body beneath brown, abdomen broadly pale along median line, narrowly at the lateral margins; genital segment darker. Legs brown; tarsi black. Hind wings fuscous.

Head much as in *clavata*, the median spine arising more posteriorly, between the eyes. Antennæ minutely pubescent, very slender, longer than head and pronotum together; first segment oblong, about as thick as the eye is wide as seen from above, second segment smaller, evenly enlarged toward apex, third very long and slender, thinner than the second, cylindrical, with an almost imperceptible enlargement at extreme apex, almost or quite straight, apex oblique; fourth as long as the first and second together, very slightly thicker than the third, fusiform but not quite regular in shape. Pronotal hood roof-like, a little more elevated than in *clavata;* convexity of pronotum bounded posteriorly by a continuous transverse impression; carinæ very low, uniseriate; paranota reflexed closely against pronotal surface. Costal margin of hemielytra slightly curved in male, more strongly so in female; costal area broader behind middle, irregularly reticulate, uniseriate anteriorly, biseriate at middle, triseriate behind middle, uniseriate at extreme apex; subcostal area almost perfectly and regularly biseriate; discoidal area a little more sinuate exteriorly than in *clavata*, extending much beyond middle of hemielytra; sutural area with larger areoles at apex and along inner margin. Legs and structures of ventral aspect much as in *clavata*, except that the bucculæ are more rounded ventrally, rostrum extends beyond hind coxæ, and the female genitalia encroach farther upon the disc of the abdomen. Wings extending beyond apex of abdomen. Form broader than in *clavata*, male narrower than the female. Length ♂ 5.4 mm., ♀ 5.5 mm.; width ♂ 1.5 mm., ♀ 1.7 mm.

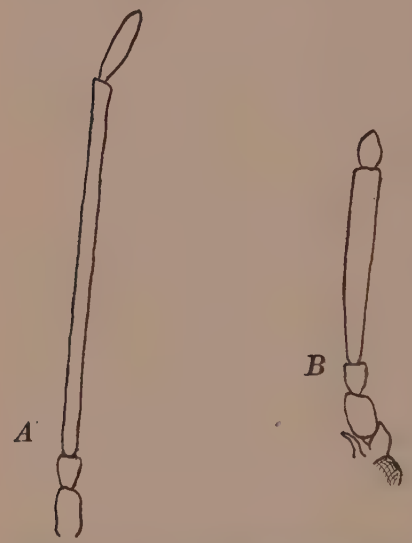


Fig. 1. Antennæ; A, *Melanorhopala infuscata* sp. nov.; B, *Alveotingis grossocerata* O. & D.

Holotype ♂, allotype, and two paratypes, ♂ and ♀, Falls Church, Va., 27, 30 July, 2 August (N. Banks) in M. C. Z., Barber's, and my collection. From bark of tulip tree (Liriodendron).

This species is easily distinguished by its slender inclavate antennæ (fig. 1, A), irregularly reticulate costal area, dark and variegated coloration, and broad form. These characters are not of subgeneric value according to the standards established in the treatment of Palæarctic genera.

Hesperotingis gen. nov.

Form ovate, broadly so in the short-winged forms; surface of hemielytra distinctly but not strongly convex in both forms. Head with two basal spines and three anterior as in allied genera; vertex with a narrow punctate area behind the median spine; antennæ incrassate, the third segment very distinctly clavate, subcylindrical at base and apex. Hood very feebly developed, prothorax otherwise as in *Melanorhopala.* Hemielytra somewhat convex, the areas distinctly limited by moderately costate veins; costal area uniseriate, subcostal almost perfectly biseriate in known species; discoidal narrow, four or five areoles wide at most, slightly sinuate exteriorly, extending beyond middle of hemielytra, similar in long- and short-winged forms; sutural as in *Melanorhopala;* apices of hemielytra not divaricate in the short-winged form. Bucculæ almost or quite contiguous anteriorly, not fused. Metasternal orifices distinct.

This genus is most closely related to *Melanorhopala* Stal and *Alveotingis* O. & D., but I have found it impossible to unite it with either even as a distinct subgenus. From the former it is distinguished by the incrassate, almost evenly clavate antennæ, convex oval form, and nondivaricate hemielytral apices in the short-winged condition, while in habitus it is totally unlike the latter, though similar in antennal structure, the form being much less convex, the hemielytral areas more distinctly defined, and the reticulation less uniform.

Type of the genus *Hesperotingis antennata* sp. nov.

Hesperotingis antennata sp. nov. (Fig. 2).

Long-winged form.—Brown; head, pronotum, and antennæ beyond the middle, infuscated; membranous portions between the

veinlets opaque white. Anterior margin of pronotum, hood, anterior portion of paranota, and margins and apical region of angulate process, yellow. Veinlets of hemielytra light brown, a few irregularly darker; veins defining discoidal area, sometimes one running obliquely across it, one extending from its apex, and one near and parallel with sutural margin, dark brown. Abdomen

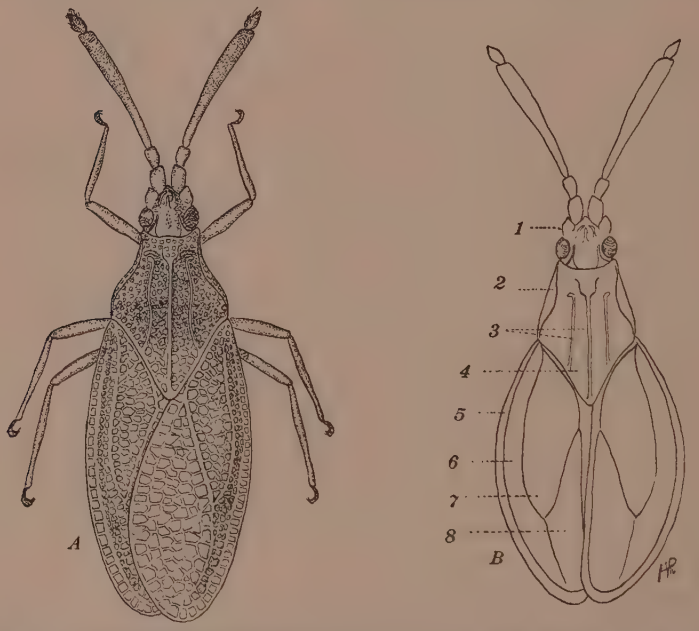


Fig. 2. *Hesperotingis antennata* gen. et sp. nov. A, long-winged ♀; B, short-winged ♀; 1, antenniferous tubercle; 2, paranotum; 3, pronotal carinae; 4, angulate process of pronotum; 5, costal area (costal membrane of Stal); 6, subcostal area (costal of Stal); 7, discoidal area; 8, sutural area (apical of Puton in long-winged form).

beneath chestnut brown, shining, sutures darker; bucculæ, sternal ridges, and pleural margins pale.

Spines of head somewhat variable in length and shape, the two anterior short, strongly curved, and almost or quite meeting over apex of median; eyes strongly granulated, as seen from above longer than wide; antenniferous tubercles as seen from above prominent, convex exteriorly, acute at apex, obliquely truncate. Antennæ almost as long as head and pronotum together; first

segment oblong, almost glabrous; second shorter and a little narrower than the first, wider toward apex, with minute decumbent pubescence; third very large, clavate, in basal third more slender than the second, in apical third about as wide as the first is long, with fine pubescence becoming denser toward apex; fourth segment small, conical, more slender than the third at apex, with long dense pubescence. Pronotum transversely convex; narrowed, subcylindrical, and depressed anteriorly, margins and apical half of angulate process depressed, flat; anterior margin arcuate, with a slightly elevated collar of one or two rows of areoles; hood represented by a small backward extension of the collar; paranota reflexed closely against pronotal surface; carinæ low, slightly divergent posteriorly, the extreme apices of the lateral outcurved, terminating at the level of the posterior margin of hood, the median percurrent. Hemielytra extending much beyond apex of abdomen, the marginal vein depressed, the costal area reflexed; sutural area with somewhat enlarged areoles. Bucculæ large, curved ventrally, angulate posteriorly; rostral sulcus deeper and wider posteriorly. Rostrum reaching hind coxæ. Hind wings extending beyond apex of abdomen. Segments of abdomen faintly and irregularly striate on apical half. Genitalia much as in allied species. Form elongate oval. Length ♀ 4.5 mm.; width 1.5 mm.

Short-winged form (fig. 2, B).—Similar in every way to the preceding, except that the general form is broadly oval; pronotum is flat and less broadened posteriorly; the carinæ parallel; hemielytra but slightly longer than abdomen, the costal margin strongly curved, apices narrowly rounded, and sutural area much reduced. Length ♀ 3.7 mm.; width 1.5 mm.

Holotype: long-winged ♀, Lakehurst, N. J., 27 June (H. G. B.) in Barber's collection; paratypes: long-winged ♀, Smiths Point, Fire Island Beach, N. Y., 19 July, 1913 (J. R. T. B.) in de la Torre Bueno's collection; short-winged ♀ ♀, Delaware Water Gap, 4 September (Mrs. A. T. Slosson) in Barber's collection; New Haven, Conn., 4 September, 1911 (C. E. Olsen) in de la Torre Bueno's collection.

A specimen from Hampton, N. H., 15 August, 1909 (S. A. Shaw) differs from the others in having very slightly shorter and uniformly dark antennæ and the subcostal area somewhat irregularly and asymmetrically reticulated with three rows of areoles in places

behind the middle. It does not appear to me to be specifically distinct and in the absence of further material may, for the sake of exact reference, be called var. **borealis** nov. Holotype in M. C. Z collection.

The example from the Delaware Water Gap, recently submitted to me by Barber, bears the MS. name *Melanorhopala slossoni* Heid.

Hesperotingis fuscata sp. nov.

Short-winged form.—Uniform dark fuscous, pronotum somewhat paler, membrane of areoles opaque gray, main veins of hemielytra black.

Anterior spines of head short, separated, but slightly curved. Antennæ shorter and thicker than in the preceding, the third segment more evenly clavate, being subcylindrical only toward apex, not at base. Hood still more reduced, scarcely noticeable as distinct from the raised pronotal margin; paranota vertical, not applied to pronotal surface; carinæ more strongly elevated, as are the chief veins of the hemielytra; subcostal area biseriate but having a few extra areoles along the middle. Other characters as in the preceding. Form broadly ovate. Length ♀ 3.4 mm.; width 1.4 mm.

Holotype: short-winged ♀, Golden, Colo. (W. J. Gerhard) in Barber's collection.

Easily distinguished from *antennata* by its uniform dark color, antennal shape, and vertical paranota.

Alveotingis O. & D.

This genus is notable for a very peculiar habitus arising from the extremely convex form and shining surface. In most of its characters it closely approaches *Melanorhopala* and *Hesperotingis*, while bearing a certain superficial resemblance to the Serenthiini although it of course lacks the pronotal and femoral structure characteristic of this tribe. It approaches the European *Oncochila* in having the hemielytral areas poorly defined, but differs widely in paranotal structure and in facies. The more important characters of *Alveotingis* may be stated as follows: form elongate oval, hemielytra very convex, their surface smooth and shining, without costate main veins, although the outlines of the areas are traceable. Head as in related genera, the antennal tubercles of

the usual structure, as in *Melanorhopala* for instance; antennæ (fig. 1, B) shaped much as in *Hesperotingis*, the third segment clavate, smallest at base and cylindrical toward apex. Thorax as in *Melanorhopala*. Costal area of hemielytra uniseriate in the only known species; subcostal biseriate; discoidal extending beyond middle of hemielytra. In the short-winged form the hemielytra are rounded at apex, not divaricate, in the long-winged they are broadly rounded at apex and widely overlapping. Bucculæ closed anteriorly. Metasternal orifices distinct.

A. grossocerata O. & D.

Probably this specific name must stand for the present, although Oshanin in his catalogue of Palaearctic Hemiptera rejects such on grammatical grounds. The type specimen of this species is a short-winged male. The figure on page 246 of Osborn and Drake's first paper is incorrect in certain important details. The antenniferous tubercles are in reality constructed just as in related genera, and have no very striking similarity to an antennal segment. The third antennal segment is almost evenly clavate (fig. 1, B) and not fusiform as in Osborn and Drake's drawing. The hemielytral areas are traceable, though stated in the description to be undifferentiated, but the main veins are scarcely elevated. The general form is more elongate and narrowed posteriorly than the drawing would indicate. In this species the rostrum reaches the middle coxæ.

Long-winged form.—Pronotum enlarged and convex as in related genera. Hemielytra ample, extending considerably beyond apex of abdomen; costal margin slightly curved; sutural area with areoles grading larger inwardly and toward apex. Hemielytra distinctly more convex than in related genera, and habitus just as in the short-winged form except for structures affected by dimorphism. Length ♀ 3.4 mm.

Described from a female specimen lacking the third and fourth antennal segments and otherwise somewhat mutilated, taken on Mt. Washington, N. H. (W. F. Fiske), and sent to me for examination by Drake. The basal antennal segments are somewhat smaller than in the short-winged type specimen of the species, but this is no doubt due to individual variation as indicated by a short-winged male example intermediate in this regard but otherwise identical, submitted to me by de la Torre Bueno.

THE NORTH AMERICAN ANTS DESCRIBED BY ASA FITCH.

By William Morton Wheeler,
Bussey Institution, Harvard University.

Asa Fitch, in his well-known report on the insects infesting fruit and forest trees, first issued in 1855 in the Transactions of the New York State Agricultural Society and in 1856 as a separate volume, published descriptions and ethological notes on six species of common North American ants which he named the "cherry ant" (*Myrmica cerasi* Fitch), the "troublesome ant" (*Myrmica molesta* Say), the "silky ant" (*Formica subsericea* Say), the "wood-eating ant" (*F. herculeana* L.; *F. ligniperda* Latr.), the "New York ant" (*F. novæboracensis* Fitch) and the "walnut ant" (*F. caryæ* Fitch). Hymenopterists have bestowed little attention on Fitch's work and have even misinterpreted some of his descriptions. A recent visit to the United States National Museum, where I found the types of his *F. novæboracensis* and *caryæ*, has led me to study the descriptions of these and the other species with a view to determining the names by which they should now be known.

1. There is no difficulty in regard to *Myrmica cerasi*, which Emery was undoubtedly right in regarding as a distinct and easily recognizable color-variety of what had been previously described by Say (1836) as *Myrmica lineolata*, now known as *Crematogaster lineolata* var. *cerasi* Fitch.

2. Fitch described at length the habits of *Myrmica molesta* Say. Mayr, Forel, Dalla Torre and others believed Say's species to be merely the common house ant, *Monomorium pharaonis* L., because Say mentioned its occurrence in dwellings, but as Fitch describes it as nesting also "in our pastures and plowed fields and sometimes doing much injury in cornfields, gnawing the blades of corn when they are but a few inches high, for the purpose of drinking the sweet juice which flows from the wounds," it is evident that he refers to what Mayr later called *Solenopsis debilis*. The European myrmecologists were misled by their inability to believe that a small *Solenopsis*, closely allied to the European *S. fugax* Latr., could become a household pest. Many years ago I showed that this is really the case and supported Emery's contention that Say's

species should be known as *Solenopsis molesta* (=*debilis* Mayr). Fitch's observations, which were unknown to me at that time, are additional confirmation of our view.

3. The silky ant, *Formica subsericea* Say, is, of course, the common form now regarded as merely a more pubescent variety of *F. fusca* L.

4. Fitch's description of *F. herculeana* and *ligniperda*, which he evidently believed to be synonymous, shows that he referred to what we now call *Camponotus herculeanus* L. subsp. *pennsylvanicus* DeGeer. He was thoroughly familiar with this insect and its habits.

5. Fitch's description of *F. noveboracensis* is very clear and shows that he had before him specimens of what Forel later called *Camponotus ligniperdus* var. *pictus*. Some years ago Pergande proved this from examination of Fitch's types. As *ligniperda* is merely a subspecies of *herculeanus*, the ant is now called *C. herculeanus* L. subsp. *ligniperda* Latr. var. *noveboracensis* Fitch. It should be noted that the last name is spelled "*novæboracensis*" by Fitch. It is, perhaps, permissible to amend so obvious an orthographic error.

6. On examining the types of Fitch's *F. caryæ* (several workers and females) in the National Museum I was surprised to find that they are identical with the form described by Emery in 1893 as *Camponotus marginatus* Latr. var. *nearcticus*. Emery subsequently discovered that Latreille's *marginatus* was a variety of *C. maculatus* Fabr. subsp. *æthiops* Fabr. and that what Roger and later myrmecologists had been calling *marginatus* was really the form described by Nylander in 1856 as *fallax*. In my later papers I therefore referred *nearcticus* and a whole series of allied subspecies and varieties to Nylander's species. It is now evident that *nearcticus* becomes a synonym of *caryæ* and that the closely related *fallax* of Europe, described a year later, becomes *C. caryæ* var. *fallax* Nyl. Hence the synonymy of the typical *caryæ* would stand as follows:

Camponotus (*Camponotus*) *caryæ* Fitch.

Formica caryæ Fitch, Trans. N. Y. State Agric. Soc. 14 (1854), 1855, pp. 855–859, ☿, ♀, ♂; First and Second Report on the Nox. Benef. and Other Ins. State N. Y., 1856, pp. 151–155; Third Report, 1859, p. 123.

?Formica atra Buckley, Proc. Ent. Soc. Phila., 6, 1866, p. 160, ☿.
Camponotus marginatus Mayr (*nec* Latreille), Verh. Zoöl. bot. Ges. Wien. 36, 1886, p. 423 (in part).
C. marginatus var. *nearcticus* Emery, Zoöl. Jahrb. Abth. f. Syst. 7, 1893, p. 675, ☿, ♀; Wheeler, Bull. Amer. Mus. Nat. Hist., 21, 1905, p. 402; Occas. Papers Boston Soc. Nat. Hist., 7, 1906, p. 24.
C. fallax Nyl. var. *nearcticus* Wheeler, Ann. Rep. N. J. State Mus. (1909), 1910, p. 663; Journ. N. Y. Ent. Soc., 18, 1910, p. 222; Ann. N. Y. Acad. Sci., 20, 1910, p. 342.

Both Cresson (Synops. Fam. Gen. Hymen., 1887, p. 255) and Dalla Torre (Catalog. Hymen., 7, 1893, p. 247) assumed that Fitch's *F. caryæ* was merely a synonym of *Camponotus pennsylvanicus*, but, as we have seen, Fitch was well acquainted with this ant under the old name *F. herculeana* and we could hardly suppose that so competent an entomologist would redescribe it under a new name. And although some of the distinctive characters are omitted in the description of *caryæ*, it is, nevertheless, sufficiently explicit, even if the ethological notes and the types did not make the identification certain.

In conclusion the twenty described subspecies and varieties that must now be referred to the American *caryæ*, as the specific type, instead of to the European *fallax*, together with their known distribution, may be listed as follows:

North American Forms.

C. caryæ Fitch.—United States and British America.
var. *minutus* Emery.—United States and British America.
var. *pardus* Wheeler.—New York and New Jersey.
var. *tanquaryi* Wheeler.—Illinois.
var. *decipiens* Emery.—Indiana to Utah.
subsp. *rasilis* Wheeler.—Gulf States to Arizona.
var. *pavidus* Wheeler.—Gulf States.
subsp. *subbarbatus* Emery.—New Jersey to California.
var. *paucipilis* Emery.—Maryland.
subsp. *discolor* Buckley.—Texas to Illinois.
var. *clarithorax* Emery.—Pennsylvania to California.
var. *cnemidatus* Emery.—Maryland.

Eurasian Forms.

C. caryæ var. *fallax* Nyl.—Southern Europe.
var. *ruzskyi* Emery.—Russia.
var. *lameerei* Emery.—Tashkund.
var. *kamensis* Ruzsky.—Kasan.
var. *himalayanus* Forel.—Himalayas.
var. *quadrinotatus* Forel.—Japan.
var. *nawai* Ito. Japan.
subsp. *vitiosus* F. Smith.—Japan.
subsp. *brunni* Forel.—Japan.

A NEW MALAYAN ANT OF THE GENUS PRODISCOTHYREA.

By William Morton Wheeler,
Bussey Institution, Harvard University.

Prodiscothyrea bryanti sp. nov.

Worker: Length, 2 mm. Very similar to the genotype *P. velutina*, which I recently described from Queensland, Australia (Trans. Royal Soc. South Australia, 40, 1916, pp. 33–37, Pl. 4), but differing in the following characters: The head is proportionally smaller and much less convex above, especially behind the frontal carinæ, the eyes are much smaller and the cheeks have a more prominent blunt tooth in front of the eyes. The antennal scapes are less abruptly narrowed at the base and the funicular joints, with the exception of the last are even more transverse, so that the whole funiculus is shorter, being scarcely longer than the scape. Thorax shorter, not $1\frac{1}{2}$ times as long as broad, less convex in front, with less angular humeri and with more distinct epinotal teeth and more nearly vertical epinotal declivity. Petiole much smaller and broader, nearly four times as broad as long and with a more pronounced, compressed, translucent tooth on its ventral surface. Postpetiole also shorter, less decidedly narrowed in front and less depressed above in front than in *velutina*. Sculpture, pubescence and color very similar to those of *velutina* but the dark median dorsal line on the postpetiole and first gastric segment is lacking.

Described from a single specimen taken on Penang Island in the Straits Settlements by Mr. G. E. Bryant and sent me by Mr.

Horace Donisthorpe. The discovery of this second species of *Prodiscothyrea* indicates that the members of the genus, like the species of *Discothyrea*, belong to a widely and discontinuously distributed and very ancient, hypogæic relict fauna, all the components of which are very rare and evidently on the verge of extinction.

ANTHOCYANIN IN *PTEROCOMMA SMITHIÆ* (Mon.).

By R. W. Glaser,
Bussey Institution, Harvard University.

Pterocomma smithiæ (Mon.), an aphid, found on the stems and twigs of willow trees, contains a red pigment which seems to be localized in the cytoplasm of the fat cells.

The pigment is soluble in water and alcohol, but especially in hydrochloric acid. A large number of aphids were rubbed up in a mortar with a few cubic centimeters of $^1/_{10}$ molecular HCl. This solution was then poured into a test tube and placed in a water bath for ten or fifteen minutes to facilitate the extraction of the pigment. After this, the liquid which became an intense dark red was filtered. If a few drops of 26 per cent. ammonia are now added the solution becomes blue or bluish green. On adding more and more of the alkali, a light green color appears, gradually passing to yellow. The reaction may be reversed at any point by adding HCl. If, after obtaining the yellow color with the alkali, one adds enough $^1/_{10}$ molecular HCl to the liquid the yellow will gradually pass back to the light green and bluish green.

These color reactions very strongly suggest the anthocyanins found in plants. Anthocyanins form red pigments with acids which turn blue on the addition of ammonia. I suggest the following possible series of reactions which might account for the red pigment in the aphids. The aphids suck up the hydroxyflavones from the plants[1] together with the sap. The hydroxyflavone is then reduced to anthocyanin in the body of the insect and later converted into the red pigment. The red pigment is deposited in the fat cells and may function as a respiratory pigment although this is not at all likely.

---

[1] Tests showed anthocyanin to be absent in twigs of willow.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

The undersigned will greatly appreciate receiving records of New Jersey species not listed in Smith's Insects of New Jersey.—Harry B. Weiss, 272 Hale St., New Brunswick, N. J.

Offered for cash, but exchange preferred. Fitch and early Illinois reports; Insect Life; Harris's Insect; many others.—J. F. Hallinen, Cooperton, Okla.

Histeridæ. North American Histeridæ identified or unidentified, desired in exchange for beetles of other families. F. G. Carnochan, Bussey Institution, Forest Hills, Massachusetts.

Hemiptera-Heteroptera. I desire specimens of this group from all regions, especially New England. I will give in exchange species of this and other orders (except Lepidoptera), and will identify New England material. Correspondence desired.—H. M. Parshley, Bussey Institution, Forest Hills, Mass.

Wanted: Psyche, Vol. IX, No. 300 (April, 1901). Address, giving price, Librarian, Stanford University, Cal.

Sarcophagidæ from all parts of the world bought or exchanged according to arrangement. North American material determined.—R. R. Parker, Entomological Laboratory, Massachusetts Agricultural College, Amherst, Mass.

Wanted: Transactions American Entomological Soc., Vol. 4; Entomological News, Vol. 2, Nos. 6 and 10; Vol. 8, Nos. 1 and 6; Vol. 9, Nos. 1 and 2; Vol. 10, No. 10; Vol. 11, Nos. 1, 3 and 5. Will purchase at reasonable price.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinæ of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Transactions American Entomological Society, vol. 4. Also will purchase specimens of Catocola Sappho.—Howard L. Clark, P. O. Box 1142, Providence, R. I.

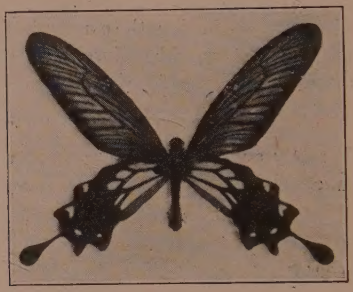
Wanted: Old Series Entom., Bul. 1, 2, 3, 33; Technical Series 4, 6, 7; Insect Life, vol. 4–6; Jour. Applied Microscopy I, N. Y. State Entom. Rep. 3, 4; Fitch Rep. 7, 8, 13.—Philip Dowell, Port Richmond, N. Y.

Would appreciate receiving date, stage and mode of hibernation of insects of all orders. J. P. Baumberger, Bussey Institution, Forest Hills, Boston, Mass.

Wanted: Ill. Ent. Rpts. 2, 3, 5, 7. 9, 10, 11, 12, 13, 19; Hensham's List of the Coleoptera of America North of Mexico, 1895. For Exchange Bulletins and Circulars U. S. Bur. Ent.—J. S. Wade, Wellington, Kan.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.



Best equipped establishment in the United States for furnishing Entomological Supplies and Specimens

Special attention is called to our

American Ent. Insect Pins.
Hand made Schmitt and other Insect boxes.
Cabinets and Exhibition Cases of the finest workmanship.
Life Histories of Insects of Economic Importance, in Riker Mounts, Pasteboard and Wooden Exhibition Cases, and Preparations in Alcohol.
Type, Mimicry and Protective coloration collections.
Collections of Household, Garden, Orchard, Forest, and Shade tree pests.
Fine specimens representing Sexual and Seasonal Dimorphism, and warning colors.

Our stock of Exotic Insects is unsurpassed, shipments from our collectors abroad arriving nearly every week.

The following lists are sent free on application:

116. Biological material for dissection.
125. Life histories of economic insects.
128. List of living pupae.
129. Exotic Lepidoptera.
130. North American Lepidoptera.
131. Exotic Coleoptera.
132. North American Coleoptera.
143. Type, Mimicry, etc., collections.
145. List of Pest collections.
147. List of Butterflies for trays and decorative work.
C-30. Catalogue of Entomological supplies.

Amer. Ent. Co. price list of Lepidoptera. 80 pages. Price 25c. Free to our customers.

New illustrated catalogue of Insects in preparation. Will be ready for distribution in about two months.

Ward's Natural Science Establishment

SUCCESSFUL Text and Reference Books that you want in your library and in your classes.

OPTIC PROJECTION

SIMON HENRY GAGE, Professor Emeritus of Histology and Embryology, Cornell University, and **HENRY PHELPS GAGE, Ph.D.,** Cornell University.

This is a very comprehensive work dealing fundamentally and practically with the Magic Lantern, the Projection Microscope, the Reflecting Lantern and the Moving Picture Machine. Library Binding. 730 pages. Over 400 figures. **Postpaid, $3.00**

HANDBOOK OF MEDICAL ENTOMOLOGY

WM. A. RILEY, Ph.D., Professor of Insect Morphology and Parasitology, Cornell University and **O. A. JOHANSEN, Ph.D.,** Professor of Biology, Cornell University.

A concise account of poisonous, parasitic and disease-carrying insects and their allies, including descriptions and illustrations of the principal species, with keys for their determination, and methods of control. Bound in Library Buckram, medium 8vo. 350 + VIII pages. Send for sample pages. **Price, $2.20 Postpaid**

THE MANUAL FOR THE STUDY OF INSECTS

J. H. COMSTOCK, Professor Emeritus of Entomology, Cornell University.

For past 20 years and still the leading college text. Now rapidly going into schools as a reference guide to insect study. 700 pages. 700 illustrations. Mailing weight, 4 lbs. **$3.75 Net**

THE NATURAL HISTORY OF THE FARM

J. G. NEEDHAM, Professor of Entomology, Cornell University.

A recent successful addition to Natural Science Literature. Well arranged for class work and for private study. 300 pages. Illustrated. **Postpaid, $1.50**

THE HANDBOOK OF NATURE-STUDY

A. B. COMSTOCK, Assistant Professor of Nature Study, Cornell University.

The most extensively used Nature-Study text before the public. Over 200 lessons on common birds, animals, insects, plants, trees, stars and the weather worked out in detail for teachers and pupils. 950 pages. 1,000 illustrations. Send for circular.

Bound in one vol., **$3.25 Net,** mailing weight, 5 lbs.
Bound in two vols., **4.00 Net,** mailing weight, 5½ lbs.

For sale at all book stores or shipped direct from

THE COMSTOCK PUBLISHING COMPANY, Ithaca, N. Y.

The Celebrated Original Dust and Pest-Proof

METAL CABINETS

FOR SCHMITT BOXES

These cabinets have a specially constructed groove or trough around the front, lined with a material of our own design, which is adjustable to the pressure of the front cover. The cover, when in place, is made fast by spring wire locks or clasps, causing a constant pressure on the lining in the groove. The cabinets, in addition to being absolutely dust, moth and dermestes proof, are impervious to fire, smoke, water and atmospheric changes. Obviously, these cabinets are far superior to any constructed of non-metallic material.

The interior is made of metal, with upright partition in center. On the sides are metal supports to hold 28 boxes. The regular size is 42½ in. high, 13 in. deep, 18¾ in. wide, inside dimensions; usually enameled green outside. For details of Dr. Skinner's construction of this cabinet, see Entomological News, Vol. XV, page 177.

METAL INSECT BOX has all the essential merits of the cabinet, having a groove, clasps, etc. Bottom inside lined with cork; the outside enameled any color desired. The regular dimensions, outside, are 9 x 13 x 2½ in. deep, but can be furnished any size.

WOOD INSECT BOX.—We do not assert that this wooden box has all the qualities of the metal box, especially in regard to safety from smoke, fire, water and dampness, but the chemically prepared material fastened to the under edge of the lid makes a box, we think, superior to any other wood insect box. The bottom is cork lined. Outside varnished. For catalogue and prices inquire of

BROCK BROS., Harvard Square, Cambridge, Mass.

1,000 PIN LABELS 25 CENTS! At your Risk. (Add 10c for Registry or Checks)

Limit: 25 Characters; 3 Blank or Printed Lines (12 Characters in Length). Additional Characters 1c per 1,000. In Multiples of 1,000 only; on Heaviest White Ledger Paper---No Border---4-Point Type---About 25 on a Strip---No Trimming---One Cut Makes a Label. SEND ME ORDER WITH COPY. FOR ANY KIND OF ARTISTIC PRINTING LARGE OR SMALL. INDEX CARDS, MAPS, SEX-MARKS, LABELS FOR MINERALS, PLANTS, EGGS, ETC. IF QUANTITY IS RIGHT, PRICE IS SURE TO BE. Labels exceeding 3 Lines [Blank or Printed] $2 per M. and up. Orders totalling less than 5,000 double price. Cash (no checks) with order.

C. V. BLACKBURN, 12 PINE STREET, STONEHAM, MASSACHUSETTS

CAMBRIDGE ENTOMOLOGICAL CLUB

A regular meeting of the Club is held on the third Tuesday of each month (July, August and September excepted) at 7.45 P. M. at the Bussey Institution, Forest Hills, Boston. The Bussey Institution is one block from the Forest Hills Station of both the elevated street cars and the N. Y., N. H. & H. R. R. Entomologists visiting Boston are cordially invited to attend.

NEW JERSEY ENTOMOLOGICAL CO.

Dealers in all orders of Insects
Life Histories of all Descriptions

Biological Material for Classes
Entomological Supplies

74 13th Ave., Newark, N. J.